

Research Note

Salmonella Prevalence in Free-Range and Certified Organic Chickens

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ABSTRACT

Many consumers assume that broiler chickens grown under traditional commercial conditions will have more *Salmonella* than free-range or organic chickens, which usually are less crowded, have access to outside spaces during grow out, and are fed special diets. Despite these perceptions, there is a lack of published information about the microbiological status of free-range and organic chickens. A total of 135 processed free-range chickens from four different commercial free-range chicken producers were sampled in 14 different lots for the presence of *Salmonella*. Overall, 9 (64%) of 14 lots and 42 (31%) of 135 of the carcasses were positive for *Salmonella*. No *Salmonella* were detected in 5 of the 14 lots, and in one lot 100% of the chickens were positive for *Salmonella*. An additional 53 all-natural (no meat or poultry meal or antibiotics in the feed) processed chickens from eight lots were tested; 25% of the individual chickens from 37% of these lots tested positive for *Salmonella*. Three lots of chickens from a single organic free-range producer were tested, and all three of the lots and 60% of the individual chickens were positive for *Salmonella*. The U.S. Department of Agriculture Food Safety and Inspection Service reported that commercial chickens processed from 2000 to 2003 had a *Salmonella* prevalence rate of 9.1 to 12.8%. Consumers should not assume that free-range or organic conditions will have anything to do with the *Salmonella* status of the chicken.

There is a perception by many consumers that commercially reared broiler chickens are grown under conditions that are too crowded, pump the birds full of hormones, and involve indiscriminate use of antibiotics to make the birds grow faster. As a result of these practices, these birds are thought to be more contaminated with *Salmonella* and other bacterial pathogens than are free-range or organic birds, which are grown under more “natural” conditions. The consuming public also may have misconceptions about what the terms *free range* and *organic* mean as applied to animal agriculture.

The only requirement listed by the U.S. Department of Agriculture (USDA) for a chicken to be called free range is access to the outside. Other countries have different definitions but often state that chickens can be stocked on grass at no more than 200 to 750 birds per acre. USDA regulations do not allow the administration of exogenous steroidal compounds (hormones) in raising poultry or swine. The USDA has put in place a set of national standards that food labeled “organic” must meet (2). Organic food is produced by farmers who emphasize the use of renewable resources and the conservation of soil and water to enhance environmental quality for future generations. Organic meat, poultry, eggs, and dairy products come from animals that are given no pesticides; fertilizers made with synthetic ingredients or sewage sludge; bioengineering; or ionizing radiation. Before a product can be labeled “organic” a govern-

ment-approved certifier inspects the farm where the food is grown to make sure the farmer is following all the rules necessary to meet USDA organic standards. The USDA Organic seal tells you that a product is at least 95% organic. The USDA makes no claims that organically produced food is safer or more nutritious than conventionally produced food, only that organic food differs from conventionally produced food in the way it is grown, handled, and processed.

Even though the USDA makes no product safety claims for free-range or organically grown chickens, there is a perception on the part of many consumers that because the conditions for growth are more natural that the products will have less *Salmonella* and other pathogenic bacteria. One reason for this perception may be the lack of published information on the microbiological quality of free-range or organic chickens. Four reports were found concerning the microbiological condition of chickens from free-range or organic production. Izat and coworkers (7) conducted a very limited survey and found that 42% of 24 chickens from a single organic company tested positive for *Salmonella* compared with 21 and 25% of chickens from two commercial (nonorganic) companies. Although it is not a peer-reviewed publication, *Consumer Reports* (1) published an article on the microbiological condition of commercial and “premium” (organic and free-range) chickens and reported that as a group, the premium chickens of expensive small brands, including free-range birds, were most contaminated. Of 69 chickens tested, 70% were positive for

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TABLE 1. *Salmonella* status of free-range chickens from four locations

Location	No. positive for <i>Salmonella</i> /no. tested (%)	
	Lots	Birds
A	2/5 (40)	6/50 (12)
B	3/5 (60)	11/50 (22)
C ^a	3/3 (100)	15/25 (60)
D	1/1 (100)	10/10 (100)
Total	9/14 (64)	42/135 (31)

^a Certified organic free-range chickens.

Campylobacter and 53% were positive for *Salmonella*. In another non-peer-reviewed report in the United Kingdom newspaper, *The Guardian* (8), the author concluded that free-range and organic chickens were no safer than conventionally reared birds. In Denmark, Heuer and coworkers (6) tested 160 broiler flocks and isolated *Campylobacter* from 100% of organic flocks, 36.7% of conventional flocks, and 49.2% of extensive indoor broiler flocks (chickens produced in a less intensive rearing system in a confined environment with a low stocking density). Because of the limited number of studies of this issue, particularly in the United States, and the perception by many consumers that free-range or organic chickens are less likely to be contaminated with bacteria, the objective of this study was to more thoroughly evaluate the prevalence of *Salmonella* on free-range and organic chickens.

MATERIALS AND METHODS

Free-range organic and all-natural chickens. All chickens tested in this study were claimed by the producers to have been reared without antibiotics, either as therapeutic treatments or as growth promoters. Free-range chickens either were reared with access to the outside or were reared outside in special houses (as defined by the producers). Chickens from three free-range producers were purchased directly from the companies, and the carcasses were shipped on ice by next-day air. Upon arrival at the laboratory, all shipments were inspected to ensure that the carcasses still contained ice. Chickens from one additional free-range producer whose chickens were grown under USDA-certified organic conditions were purchased locally from a retail grocery store. Chickens that were reared on feed with no animal by-products (all natural) by three additional companies were purchased from retail grocery stores. Chickens were transported to the laboratory and samples were obtained within 1 h. For each producer, samples were obtained from lots of 5 to 10 chickens, depending on the availability of chickens. A lot was defined as the number of chickens either received from a producer or bought from a grocery store on a specified day. Because of how the samples were obtained, exact processing conditions of each company are not reported.

Carcass sampling. Chicken carcasses were removed from packaging and placed into puncture-proof bags. Sterile distilled water (100 ml) was added to each bag, and the carcasses were shaken for 60 s. Carcasses were removed from the rinse material, and sufficient 10× buffered peptone water (BPW; Becton Dickinson, Sparks, Md.) was added to each bag to make a 1× BPW final solution, which was incubated overnight at 35°C. The next day, 0.1 ml of the BPW was transferred to 9.9 ml of tetrathionate

TABLE 2. *Salmonella* status of all-natural antibiotic-free chickens from three locations

Location	No. positive for <i>Salmonella</i> /no. tested (%)	
	Lots	Birds
A	1/2 (50)	7/20 (35)
B	1/2 (50)	1/12 (8)
C	1/4 (25)	5/21 (24)
Total	3/8 (37)	13/53 (25)

brilliant green (TT; Becton Dickinson) broth (5) and incubated overnight at 42°C, and 0.5 ml of the BPW was transferred to Rappaport Vassaliadis (RV; Becton Dickinson) broth and incubated overnight at 35°C. Plates of BG sulfa (Becton Dickinson) and modified lysine iron agar (Oxoid, Ottawa, Ontario, Canada) were then streaked for isolation of *Salmonella* colonies, and plates were incubated overnight at 35°C. Two typical *Salmonella* CFUs from each plate were picked onto triple sugar iron (TSI; Becton Dickinson) and lysine iron agar (LIA; Becton Dickinson) slants and incubated overnight at 35°C. Samples with typical reactions on TSI and LIA were serogrouped using somatic O antisera (Becton Dickinson). *Salmonella* cultures were then confirmed using latex agglutination (Microbact, Med-Ox, Ogdensburg, N.Y.). Carcasses were reported as positive for *Salmonella* when *Salmonella* was isolated from either TT or RV broths.

RESULTS AND DISCUSSION

Salmonella was found in 9 (64%) of 14 lots and 42 (31%) of 135 individual free-range birds (Table 1). For each of the four free-range producers, at least 40% of the lots were tested and 12 to 100% of individual chickens were positive for *Salmonella*. Three (100%) of 3 lots and 15 (60%) of 25 individual chickens from the one free-range organic producer were positive for *Salmonella*. Three (37%) of 8 lots and 13 (25%) of 53 individual birds from the all-natural producers were positive for *Salmonella* (Table 2).

Specific standard commercial chicken production controls could not be evaluated for each of the free-range or all-natural producers. However, general comparisons to published data from the U.S. commercial broiler industry can be made. The USDA Food Safety and Inspection Service (FSIS) (3) reports prevalence data each year from the pathogen reduction hazard analysis critical control point verification system. The FSIS recognizes that the prevalence data reported from this system have limitations that restrict the range of statistical inferences that can be made from the data. However, the data do represent the range of *Salmonella* prevalence seen in the U.S. poultry industry. The FSIS data from 2000, 2001, 2002, and 2003 for all sizes of chicken establishments produced *Salmonella* prevalence rates of 9.1, 11.9, 11.3, and 12.8%, respectively (3). When the 2003 data were broken down by the size of the plant, *Salmonella* was found in processed chickens from large establishments, small establishments, and very small establishments at prevalence rates of 12.2, 14.5, and 16.7%, respectively (3).

Salmonella was more prevalent in the free-range (31%) and all-natural (25%) chickens surveyed in this study than in the chickens from the U.S. commercial poultry industry

surveyed for the FSIS reports in 2000 to 2003 (9.1 to 12.8%). However, 10 of the 22 lots of free-range and all-natural chickens tested had no detectable *Salmonella*, a finding very similar to that reported from a multistate epidemiological investigation (19 of 32 lots of broiler chickens from four states had no detectable *Salmonella*) (4). The greater prevalence of *Salmonella* in free-range chickens should not be surprising because free-range chickens have access to the outside, where there is sufficient opportunity for exposure to wild birds, insects, rodent droppings, and other potential carriers of *Salmonella*. One example of this increased risk of exposure to *Salmonella* from free-range chickens was reported by Parry and coworkers (9), who evaluated the risk factors for *Salmonella* food poisoning in domestic kitchens in Wales. They found that only the consumption of raw eggs and the handling of free-range eggs were significant risk factors. These results suggest that *Salmonella* was more prevalent in eggs from free-range chickens than in eggs from commercial chickens.

Chickens from only one certified organic free-range producer were tested in this study. As with the other free-range chickens, the higher incidence of *Salmonella* in comparison to commercial chickens was expected. Other than a less confined space, there is nothing about the growing conditions of free-range chickens that should be expected to reduce the probability of *Salmonella* or other enteric pathogens in the final processed carcass. In addition to the free-range exposure to potential *Salmonella* sources, grains that are used to feed these chickens may be grown with animal-waste fertilizers. The *Salmonella* incidence rates reported in these studies are similar to and expand on those of the limited studies of Izat and coworkers (7) and *Consumer Reports* (1).

Consumers should understand the different definitions of free-range, organic, and all-natural chickens, as defined in the USDA publications. The data presented here confirm those of previously published reports indicating that free-range, organic, and all-natural chickens are no less likely

to carry *Salmonella* (and in some instances are more likely to be contaminated) than are typical commercially reared chickens. There are many reasons that consumers may choose to purchase free-range, all-natural, or organic chickens, but based on the results of this study, consumers should not assume that the prevalence of *Salmonella* is lower for these chickens than for conventional commercial chickens.

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